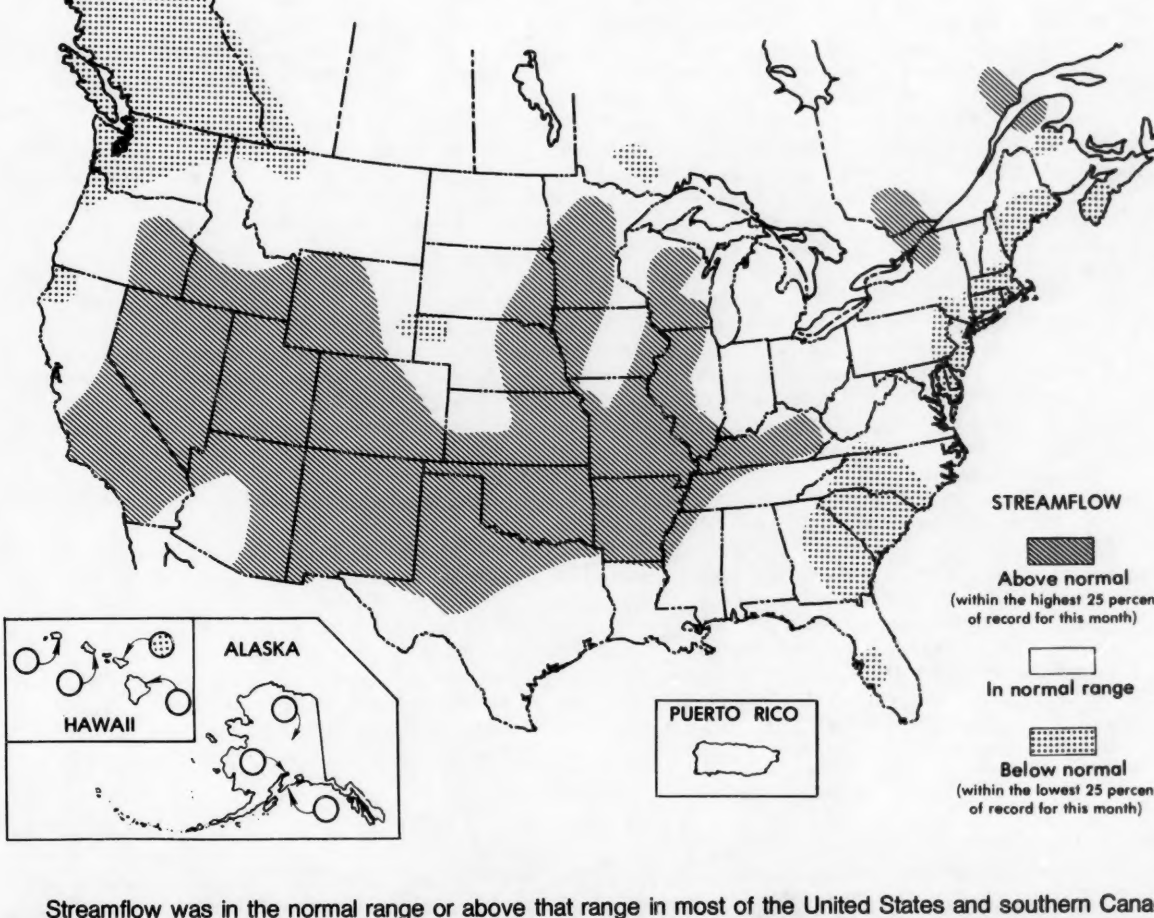
National Water Conditions

UNITED STATES
Department of the Interior
Geological Survey

CANADA
Department of the Environment
Water Resources Branch

DECEMBER 1984

STREAMFLOW DURING DECEMBER



Streamflow was in the normal range or above that range in most of the United States and southern Canada during December. Below-normal flows persisted in parts of Nova Scotia, the Atlantic Coastal States, Saskatchewan, British Columbia, and Hawaii. Flows decreased into the below-normal range in parts of southwestern Canada, Washington, Oregon, California, Wyoming, Nebraska, Virginia, the Carolinas, and Georgia.

Warm temperatures, melting snow, and heavy rains at the end of the month combined to cause floods with recurrence intervals of 75 years or greater in southwestern New Mexico and 100 years or greater just east of Lake Ontario in New York. Estimated property damage was five to ten million dollars in New Mexico and about 1,000 people were evacuated from their homes in Oswego County, New York.

STREAMFLOW CONDITIONS DURING DECEMBER 1984

Streamflow generally increased seasonally in Nova Scotia, New Hampshire, Vermont, New York, Connecticut, Massachusetts, Rhode Island, in the Coastal States from New Jersey to South Carolina, and in West Virginia, Ohio, Indiana, Michigan, Arkansas, and Arizona. Monthly mean flows remained in the above-normal range in parts of Quebec, Kentucky, Illinois, Wisconsin, Minnesota, South Dakota, Nebraska, Iowa, Missouri, Arkansas, and in most States from the Rocky Mountains to the Sierra Nevada/Cascade Range. Mean flows increased into the above-normal range in Oklahoma and parts of adjacent States, and in parts of Quebec and New York. Mean flows at index sites on the Humboldt River at Palisades, Nevada and on the Snake River at Weiser, Idaho have remained in the above-normal range for 30 consecutive months, illustrating the overall wet trend in the West during the last 2 to 3 years. Monthly mean flow of the North Platte River above Seminoe Reservoir near Sinclair, Wyoming (drainage area 8,134 square miles) was 620 cfs (cubic feet per second), the highest for the month in 46 years of record, the second consecutive record-breaking month, and the 8th consecutive month of flows in the above-normal range at that site. Monthly mean discharge of 5,761 cfs on the Colorado River near Cisco, Utah (drainage area 24,100 square miles) was also the highest of record (73 years) for the second consecutive month, and remained in the above-normal range for the 20th consecutive month. These record-breaking monthly mean flows occurred despite seasonal decreases in streamflow in both Wyoming and Utah.

In contrast, streamflow decreased seasonally in western Florida where the monthly mean flow of 84 cfs and the daily mean flow of 63 cfs on December 26 at the Peace River at Arcadia, Florida (drainage area 1,367 square miles) were lowest for December in 53 years of record, and marked the 4th consecutive month of record low flows. Streamflows also generally decreased in Tennessee, Wisconsin, Minnesota, the Dakotas, most States from Nebraska westward to the coast, southwestern Canada, Alaska, and Puerto Rico. Flows were variable elsewhere in the United States and southern Canada. Monthly mean flows remained in the below-normal range in parts of Hawaii, southwestern Canada, Ontario, the Atlantic Provinces, Maine, Massachusetts, New York and Coastal States southward to Maryland, the Carolinas, and Florida. During December, mean flows decreased into the below-normal range in parts of Rhode Island, Long Island, N.Y., Virginia, Nebraska, Colorado, California, Oregon, Washington, and southwestern Canada.

Floods on eastern shore tributaries to Lake Ontario in New York occurred between December 29–31 with recurrence intervals of about 100 years or greater at five gaging stations in the area and similar floods occurred in southwestern New Mexico on December 28 (see accompanying table and maps). Warm temperatures, snowmelt, and heavy rains were all contributing factors for the floods in both areas which resulted in about 1,000 persons being evacuated from their homes in Oswego County, New York, and estimated flood damages of five to ten million dollars in New Mexico. Flood stages, as designated by the National Weather Service, were exceeded on many rivers and small streams in West Virginia, Kentucky, Illinois, Minnesota, Missouri, Arkansas, Mississippi, Louisiana, Texas, California, New Mexico, and parts of Nevada, Arizona, Wisconsin, Michigan, Indiana, Ohio, Pennsylvania, and Vermont with minor to moderate flooding affecting mainly lowlands and agricultural lands.

Streamflow at the 12 index gaging stations in Wyoming, Colorado, and Utah averaged about twice the long-term median flow with 11 of the 12 sites in the above-normal range. The Great Salt Lake rose 0.35 foot to an elevation of 4,208.65 feet above mean sea level, 2.75 feet higher than a year ago, and only 2.95 feet lower than the alltime high elevation of record set in 1873.

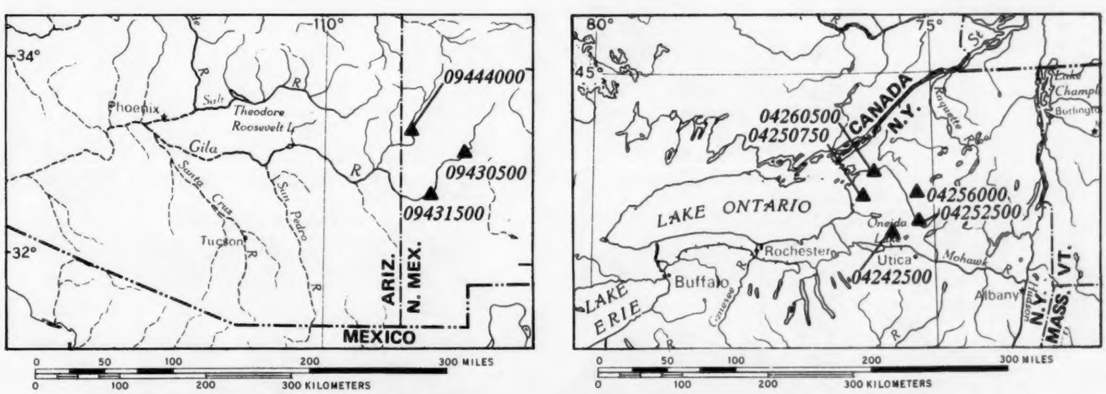
The combined flow of the three largest rivers in the lower 48 States—Mississippi, St. Lawrence, and Columbia rivers—was 1,094,500 cfs during December, about the same as last month, and 33 percent above the long-term average. Monthly means were in the above-normal range for both the St. Lawrence and Mississippi rivers. These three large river systems account for runoff from more than half of the conterminous United States, and provide a useful check on the status of the Nation's surface-water resources.

Contents of selected reservoirs generally declined in Maine, New Jersey, South Carolina, Alabama, the Tennessee Valley, Wisconsin, and Minnesota but remained close to, or above average, in the Tennessee Valley, Wisconsin, and Minnesota. Both changes in contents and month-end contents varied widely in the rest of the nation, but most reservoirs in California, Arizona, Wyoming, and Oklahoma were above average. Many reservoirs remained below average in Texas.

CONTENTS

FLOOD DATA FOR SELECTED SITES IN NEW YORK AND NEW MEXICO, DECEMBER 1984

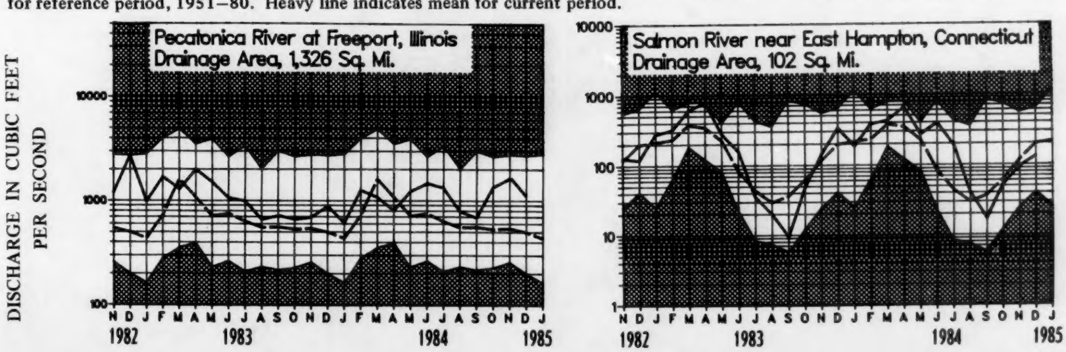
WRD station number	Stream and place of determination	Drainage area (square miles)	Period of known floods	Maximum flood previously known			Maximum during present flood				
				Date	Stage (feet)	Discharge (cfs)	Date	Stage (feet)	Discharge		Recurrence interval (years)
									Cfs	Cfs per square mile	
	NEW YORK										
	STREAMS TRIBUTARY TO LAKE ONTARIO										
04242500	East Branch Fish Creek at Taberg.	188	1923–	June 22, 1972	11.71	14,500	Dec. 29	12.8	15,000	80	100
04250750	Sandy Creek near Adams.	128	1957–	Apr. 4, 1963	11.01	11,800	29	10.63	10,000	78	100
04252500	Black River near Boonville.	304	1911–	Apr. 18, 1982	11.31	12,800	30	11.4	14,800	49	>100
04256000	Independence River at Donnattsburg.	88.7	1942–	Apr. 18, 1982	9.73	5,530	30	13.27	10,000	113	>100
04260500	Black River at Watertown.	1,874	1920–	Mar. 16, 1977	12.98	39,600	31	13.1	41,000	22	100
	NEW MEXICO										
	GILA RIVER BASIN										
09430500	Gila River near Gila . .	1,864	1914, 1927–	Dec. 18, 1978	12.5	32,400	Dec. 28	12.3	31,000	17	>100
09431500	Gila River near Redrock.	2,829	1904–55, 1962–	Dec. 19, 1978	29.8	48,800	28	21.0	30,100	11	75
09444000	San Francisco River near Glenwood.	1,653	1927–	Oct. 20, 1972	16.61	24,000	28	13.8	17,900	11	75



Locations of stream-gaging stations in New Mexico and New York described in table of peak stages and discharges.

SURFACE WATER – MONTHLY MEAN DISCHARGE IN KEY STREAMS

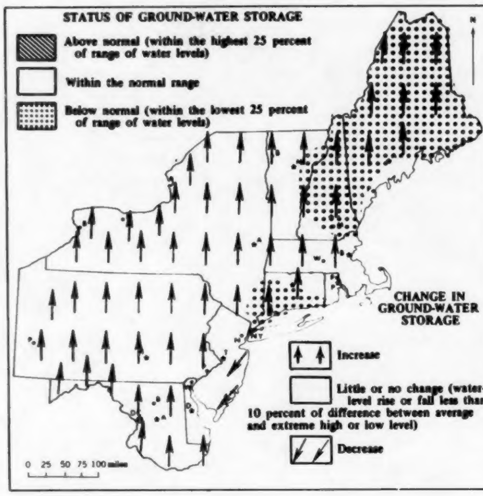
Unshaded area indicates range between highest and lowest record for the month. Dashed line indicates median of monthly values for reference period, 1951–80. Heavy line indicates mean for current period.



GROUNDWATER CONDITIONS DURING DECEMBER 1984

Ground-water levels continued to rise in most of the Northeast. (See map.) However, in parts of coastal New England and New Jersey and on Long Island, New York, levels changed only slightly or declined. Levels near the end of December remained below seasonal averages in much of Maine, New Hampshire, and southern Connecticut. Elsewhere in the northeast, levels did not have a consistent high or low pattern and were mostly within an average range of levels for this time of year. Levels were reported to be above average in some observation wells in central and western New York State.

In the Southeastern States, ground-water levels rose in Kentucky and in most wells in Mississippi, and declined in Virginia; trends were mixed in other States. Water levels were above average in Kentucky, and mixed with respect to average in other reporting States. A new high ground-water level for December was reached in Kentucky, and a new low level for December was noted in the key well in Memphis, Tennessee, despite a slight net rise during the month.



Map shows ground-water storage near end of December and change in ground-water storage from end of November to end of December.

MONTH-END GROUND-WATER LEVELS IN KEY WELLS

Unshaded area indicates range between highest and lowest record for the month. Dashed line indicates average of monthly levels in previous years. Heavy line indicates level for current period.

Provisional data; subject to revision

WATER LEVELS IN KEY OBSERVATION WELLS IN SOME REPRESENTATIVE AQUIFERS IN THE CONTERMINOUS UNITED STATES—DECEMBER 1984

Aquifer and location	Water level in feet with reference to land-surface datum	Departure from average in feet	Net change in water level in feet since:		Year records began	Remarks
			Last month	Last year		
Glacial drift at Hanska, south-central Minnesota	–7.44	+1.00	–0.23	+2.68	1942	
Glacial drift at Roscommon in north-central part of Lower Peninsula, Michigan	–4.35	+0.51	+0.02	–0.22	1935	
Glacial drift at Marion, Iowa	–3.36	+3.06	+0.88	–0.75	1941	
Glacial drift at Princeton in northwestern Illinois	–8.95	+4.96	+0.79	–2.45	1943	
Petersburg Granite, southeastern Piedmont near Fall Zone, Colonial Heights, Virginia	–17.89	–1.96	–0.24	–1.35	1939	
Glacial outwash sand and gravel, Louisville, Kentucky (U.S. well no. 2)	–16.83	+8.97	+0.26	+1.03	1946	
500-foot sand aquifer near Memphis, Tennessee (U.S. well no. 2)	–103.97	–15.14	+0.01	–0.34	1941	December low.
Granite in eastern Piedmont Province, Chapel Hill, North Carolina (U.S. well no. 5)	–40.77	+2.82	–0.92	+1.10	1931	
Sparta Sand in Pine Bluff industrial area, Arkansas	–228.90	...	–1.00	...	1958	
Eutaw Formation in the City of Montgomery, Alabama (U.S. well no. 4)	–19.0	+2.6	+1.8	–1.6	1952	
Limestone aquifer on Cockspur Island, Savannah area, Georgia (U.S. well no. 6)	–32.20	+5.87	+0.82	+0.30	1956	
Sand and gravel in Puget Trough, Tacoma, Washington	–100.48	+10.01	+0.40	+0.90	1952	
Pleistocene glacial outwash gravel, North Pole, northern Idaho (U.S. well no. 3)	–454.1	+7.4	+0.5	+2.2	1929	
Snake River Group: southwestern Snake River Plain aquifer, at Eden, Idaho	–121.3	–4.1	–1.4	+1.4	1957	
Alluvial valley fill in Flowell area, Millard County, Utah (U.S. well no. 9)	–0.60	+28.66	+0.80	+23.20	1929	
Alluvial sand and gravel, Platte River Valley, Ashland, Nebraska (U.S. well no. 6)	–4.70	+1.53	+0.10	+0.84	1935	
Alluvial valley fill in Steptoe Valley, Nevada	–8.32	+4.84	+0.26	+1.61	1950	Alltime high.
Pleistocene terrace deposits in Kansas River valley, at Lawrence, northeastern Kansas	–20.35	+0.63	+0.25	+0.87	1953	
Alluvium and Paso Robles clay, sand, and gravel, Santa Maria Valley, California	–96.74	+49.57	+0.23	+13.64	1957	Alltime high.
Valley fill, Elfrida area, Douglas, Arizona (U.S. well no. 15)	–106.3	–27.6	+0.5	+2.3	1951	
Hueco bolson, El Paso area, Texas	–262.45	–17.27	+0.45	–1.72	1965	December low.
Evangeline aquifer, Houston area, Texas	–312.80	–11.98	–1.27	–5.45	1965	

In the central and western Great Lakes States, ground-water levels rose in Ohio and in most of Iowa, and declined in most wells in Minnesota. Trends were mixed in other reporting States. Water levels were close to average in Wisconsin, Indiana, and Ohio, mostly above average in Iowa, and mixed with respect to average in Minnesota and Michigan. No new extremes were reported.

In the Western States, ground-water levels rose in Washington, Nebraska, and New Mexico, and declined in North Dakota. Trends were mixed in other Western States. Water levels were above average in Washington and Nebraska, and below average in Texas. Levels were mixed with respect to average in other States. New high ground-water levels for December were set in a key well in Idaho and in two key wells in Utah, although each of these wells showed a slight net decline during the month. Again, despite net rises during the month, two key wells in Kansas, and a well each in New Mexico and Texas, recorded new December lows. A new alltime high water level in 28 years of record was reached in the Santa Maria well in southern California, and an alltime high level was set for the second consecutive month in the Steptoe Valley well in Nevada in 34 years of record.

USABLE CONTENTS OF SELECTED RESERVOIRS NEAR END OF DECEMBER 1984

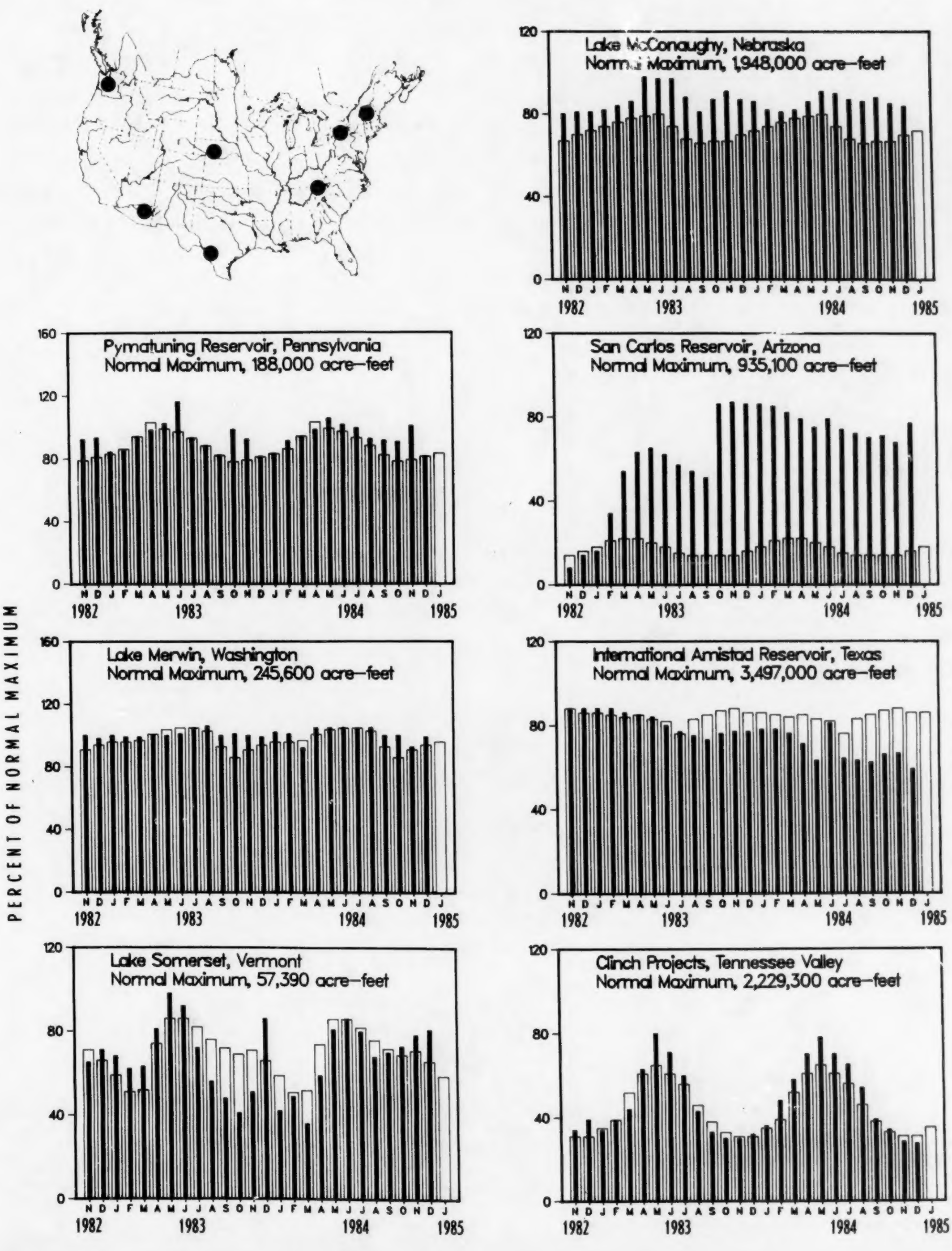
[Contents are expressed in percent of reservoir capacity. The usable storage capacity of each reservoir is shown in the column headed "Normal maximum."]

Reservoir Principal uses: F–Flood control I–Irrigation M–Municipal P–Power R–Recreation W–Industrial	Percent of normal maximum				Normal maximum (acre-feet)[a]
	End of Dec. 1984	End of Dec. 1983	Average for end of Dec.	End of Nov. 1984	
NOVA SCOTIA					
Rossignol, Mulgrave, Falls Lake, St. Margaret's Bay, Black, and Ponhook Reservoirs (P)	23	38	50	23	[b]226,300
QUEBEC					
Allard (P)	74	56	58	75	280,600
Gouin (P)	79	70	65	79	6,954,000
MAINE					
Seven reservoir systems (MP)	38	78	58	43	4,098,000
NEW HAMPSHIRE					
First Connecticut Lake (P)	58	65	58	62	76,450
Lake Francis (FPR)	61	82	70	61	99,310
Lake Winnipesaukee (PR)	56	88	62	53	165,700
VERMONT					
Harriman (P)	76	87	59	70	116,200
Somerset (P)	86	86	67	78	57,390
MASSACHUSETTS					
Cobble Mountain and Borden Brook (MP)	62	78	72	63	77,920
NEW YORK					
Great Sacandaga Lake (FPR)	52	56	52	48	786,700
Indian Lake (FMP)	82	84	61	64	103,300
New York City reservoir system (MW)	56	70	...	52	1,680,000
NEW JERSEY					
Wanaque (M)	54	101	71	61	85,100
PENNSYLVANIA					
Allegheny (FPR)	35	55	34	32	1,180,000
Pymatuning (FMR)	83	81	81	91	188,000
Raystown Lake (FR)	67	68	53	66	761,900
Lake Wallenpaupack (PR)	52	79	56	48	157,800
MARYLAND					
Baltimore municipal system (M)	94	95	84	93	261,900
NORTH CAROLINA					
Bridgewater (Lake James) (P)	90	96	77	91	288,800
Narrows (Badin Lake) (P)	91	97	94	86	128,900
High Rock Lake (P)	14	71	61	32	234,800
SOUTH CAROLINA					
Lake Murray (P)	79	80	60	78	1,614,000
Lakes Marion and Moultrie (P)	71	87	60	74	1,862,000
SOUTH CAROLINA--GEORGIA					
Clark Hill (FP)	47	83	53	50	1,730,000
GEORGIA					
Burton (PR)	69	78	52	82	104,000
Sinclair (MPR)	88	97	74	67	214,000
Lake Sidney Lanier (FMPR)	54	64	51	53	1,686,000
ALABAMA					
Lake Martin (P)	71	95	60	79	1,375,000
TENNESSEE VALLEY					
Clinch Projects: Norris and Melton Hill Lakes (FPR)	31	32	31	33	2,229,300
Douglas Lake (FPR)	12	17	11	20	1,394,000
Hiwassee Projects: Chatuge, Nottely, Hiwassee, Apalachia, Blue Ridge, Ocoee 3, and Parksville Lakes (FPR)	44	54	38	54	1,012,000
Holston Projects: South Holston, Watauga, Boone, Fort Patrick Henry, and Cherokee Lakes (FPR)	38	36	32	41	2,880,000
Little Tennessee Projects: Nantahala, Thorpe, Fontana, and Chilhowee Lakes (FPR)	40	51	39	42	1,478,000
WISCONSIN					
Chippewa and Flambeau (PR)	72	78	62	80	365,000
Wisconsin River (21 reservoirs) (PR)	73	80	54	78	399,000
MINNESOTA					
Mississippi River headwater system (FMR)	23	26	23	26	1,640,000
NORTH DAKOTA					
Lake Sakakawea (Garrison) (FIPR)	86	87	85	88	22,700,000
SOUTH DAKOTA					
Angostura (I)	71	75	73	69	127,600
Belle Fourche (I)	58	52	44	53	185,200
Lake Francis Case (FIP)	57	61	56	48	4,834,000
Lake Oahe (FIP)	81	82	...	83	22,530,000
Lake Sharpe (FIP)	101	102	96	99	1,725,000
Lewis and Clarke Lake (FIP)	91	92	91	91	477,000

Reservoir Principal uses: F–Flood control I–Irrigation M–Municipal P–Power R–Recreation W–Industrial	Percent of normal maximum				Normal maximum (acre-feet)[a]
	End of Dec. 1984	End of Dec. 1983	Average for end of Dec.	End of Nov. 1984	
NEBRASKA					
Lake McConaughy (IP)	82	87	71	85	1,948,000
OKLAHOMA					
Eufaula (FPR)	113	80	82	102	2,378,000
Keystone (FPR)	104	78	90	73	661,000
Tenkiller Ferry (FPR)	129	90	91	110	628,200
Lake Altus (FIMR)	7	39	48	7	133,000
Lake O'The Cherokees (FPR)	107	87	79	92	1,492,000
OKLAHOMA--TEXAS					
Lake Texoma (FMPRW)	97	95	90	91	2,722,000
TEXAS					
Bridgeport (IMW)	61	76	46	55	386,400
Canyon (FMR)	81	88	76	81	385,600
International Amistad (FIMPW)	58	77	85	68	3,497,000
International Falcon (FIMPW)	34	46	78	33	2,668,000
Livingston (IMW)	103	101	85	101	1,788,000
Possum Kingdom (IMPRW)	86	90	97	84	570,200
Red Bluff (PI)	29	13	28	29	307,000
Toledo Bend (P)	88	91	82	88	4,472,000
Twin Buttes (FIM)	9	21	32	9	177,800
Lake Kemp (IMW)	69	102	84	70	268,000
Lake Meredith (FWM)	35	43	38	35	796,900
Lake Travis (FIMPRW)	62	79	78	58	1,144,000
MONTANA					
Canyon Ferry (FIMPR)	76	87	86	80	2,043,000
Fort Peck (FPR)	86	86	84	88	18,910,000
Hungry Horse (FIPR)	77	76	77	84	3,451,000
WASHINGTON					
Ross (PR)	69	71	69	82	1,052,000
Franklin D. Roosevelt Lake (IP)	94	88	95	94	5,022,000
Lake Chelan (PR)	52	57	55	67	676,100
Lake Cushman (PR)	42	48	84	55	359,500
Lake Merwin (P)	100	99	96	92	245,600
IDAHO					
Boise River (4 reservoirs) (FIP)	52	70	58	53	1,235,000
Coeur d'Alene Lake (P)	28	41	56	60	238,500
Pend Oreille Lake (FP)	35	58	50	34	1,561,000
IDAHO--WYOMING					
Upper Snake River (8 reservoirs) (MP)	70	51	62	69	4,401,000
WYOMING					
Boysen (FIP)	80	79	75	88	802,000
Buffalo Bill (IP)	75	78	68	79	421,300
Keyhole (F)	41	26	43	41	193,800
Pathfinder, Seminoe, Alcova, Kortes, Glendo, and Guernsey Reservoirs (I)	67	73	47	71	3,056,000
COLORADO					
John Martin (FIR)	67	24	13	63	364,400
Taylor Park (IR)	64	60	54	66	106,200
Colorado–Big Thompson project (I)	84	83	56	85	722,600
COLORADO RIVER STORAGE PROJECT					
Lake Powell; Flaming Gorge, Fontenelle, Navajo, and Blue Mesa Reservoirs (IFPR)	90	90	...	93	31,620,000
UTAH--IDAHO					
Bear Lake (IPR)	77	80	58	82	1,421,000
CALIFORNIA					
Folsom (FIP)	60	80	54	61	1,000,000
Hetch Hetchy (MP)	51	86	37	57	360,400
Isabella (FIR)	43	53	26	44	568,100
Pine Flat (FI)	59	77	47	55	1,001,000
Clair Engle Lake (Lewiston) (P)	78	87	73	79	2,438,000
Lake Almanor (P)	84	93	49	87	1,036,000
Lake Berryessa (FIMW)	86	104	78	84	1,600,000
Millerton Lake (FI)	48	83	55	34	503,200
Shasta Lake (FIPR)	71	78	68	73	4,377,000
CALIFORNIA--NEVADA					
Lake Tahoe (IPR)	73	87	48	76	744,600
NEVADA					
Rye Patch (I)	83	84	54	94	194,300
ARIZONA--NEVADA					
Lake Mead and Lake Mohave (FIMP)	91	94	70	92	27,970,000
ARIZONA					
San Carlos (IP)	82	98	19	72	935,100
Salt and Verde River system (IMPR)	88	82	39	76	2,019,100
NEW MEXICO					
Conchas (FIR)	62	68	79	61	330,100
Elephant Butte and Caballo (FIPR)	68	56	30	64	2,453,000

[a]1 acre-foot = 0.0436 million cubic feet = 0.326 million gallons = 0.504 cubic feet per second day.
[b]Thousands of kilowatt-hours (the potential electric power that could be generated by the volume of water in storage).

USABLE CONTENTS OF SELECTED RESERVOIRS AND RESERVOIR SYSTEMS, NOVEMBER 1982 TO DECEMBER 1984



FLOW OF LARGE RIVERS DURING DECEMBER 1984

Station number	Stream and place of determination	Drainage area (square miles)	Mean annual discharge through September 1980 (cubic feet per second)	December 1984: Monthly mean discharge (cubic feet per second)	Percent of median monthly discharge, 1951–80	Change in discharge from previous month (percent)	Discharge near end of month: Cubic feet per second	Million gallons per day	Date
01014000	St. John River below Fish River at Fort Kent, Maine	5,690	9,647	3,939	80	–30	2,800	1,810	31
01318500	Hudson River at Hadley, N.Y	1,664	2,909	3,280	132	+120	15,500	10,020	31
01357500	Mohawk River at Cohoes, N.Y	3,456	5,734	6,710	128	+131	20,000	13,000	31
01463500	Delaware River at Trenton, N.J	6,780	11,750	7,198	62	+103	11,000	7,100	31
01570500	Susquehanna River at Harrisburg, Pa	24,100	34,530	47,200	138	+280	40,800	26,370	31
01646500	Potomac River near Washington, D.C.	11,560	[1]11,490	12,500	125	+125	12,000	7,800	31
02105500	Cape Fear River at William O. Huske Lock near Tarheel, N.C.	4,810	5,005	1,900	49	+40	1,320	853	31
02131000	Pee Dee River at Peedee, S.C	8,830	9,851	5,070	68	+36	3,920	2,534	28
02226000	Altamaha River at Doctortown, Ga	13,600	13,880	5,171	65	+23	3,670	2,371	31
02320500	Suwannee River at Branford, Fla	7,880	6,987	3,500	109	–9	3,300	2,130	31
02358000	Apalachicola River at Chattahoochee, Fla	17,200	22,570	14,270	84	+27	14,340	9,268	27
02467000	Tombigbee River at Demopolis lock and dam near Coatopa, Ala	15,400	23,300	21,834	107	+90	5,750	3,720	31
02489500	Pearl River near Bogalusa, La	6,630	9,768	13,700	250	+81	4,500	2,910	31
03049500	Allegheny River at Natrona, Pa	11,410	[1]19,480	25,610	98	–22	31,800	20,550	26
03085000	Monongahela River at Braddock, Pa.	7,337	[1]12,510	20,150	136	+51	27,700	17,900	21
03193000	Kanawha River at Kanawha Falls, W. Va	8,367	12,590	13,130	95	+35	25,300	16,350	27
03234500	Scioto River at Higby, Ohio	5,131	4,547	4,615	114	+43	3,720	2,404	28
03294500	Ohio River at Louisville, Ky[2]	91,170	116,000	168,000	130	+53	251,420	162,497	26
03377500	Wabash River at Mount Carmel, Ill	28,635	27,220	37,500	163	+56	52,600	34,000	31
03469000	French Broad River below Douglas Dam, Tenn	4,543	6,798	6,961	106	+142	.....	.....	...
04084500	Fox River at Rapide Croche Dam, near Wrightstown, Wis[2]	6,150	4,163	4,236	118	–11	1,728	1,117	24
04264331	St. Lawrence River at Cornwall, Ontario–near Massena, N.Y[3]	299,000	242,700	260,800	109	–2	240,000	155,000	31
02NG001	St. Maurice River at Grand Mere, Quebec	16,300	25,150	17,000	128	+20	18,600	12,020	31
05082500	Red River of the North at Grand Forks, N. Dak	30,100	2,551	1,476	128	–28	1,520	982	31
05133500	Rainy River at Manitou Rapids, Minn.	19,400	12,830	8,600	87	+12	8,200	5,300	21
05330000	Minnesota River near Jordan, Minn.	16,200	3,402	3,620	555	–42	2,600	1,680	31
05331000	Mississippi River at St. Paul, Minn	36,800	[1]10,610	11,885	245	–41	12,000	7,760	31
05365500	Chippewa River at Chippewa Falls, Wis	5,600	5,100	4,137	131	–6	5,240	3,386	31
05407000	Wisconsin River at Muscoda, Wis	10,300	8,617	10,597	163	–29	13,000	8,400	31
05446500	Rock River near Joslin, Ill	9,551	5,873	7,230	154	–28	7,800	5,040	31
05474500	Mississippi River at Keokuk, Iowa	119,000	62,620	62,300	171	–38	120,100	77,620	31
06214500	Yellowstone River at Billings, Mont	11,796	7,038	2,869	95	–30	3,400	2,200	31
06934500	Missouri River at Hermann, Mo	524,200	79,490	86,150	213	–23	170,000	110,000	31
07289000	Mississippi River at Vicksburg, Miss[4]	1,140,500	576,600	754,742	152	+3	877,000	566,800	26
07331000	Washita River near Dickson, Okla.	7,202	1,368	2,185	565	+91	250	161	19
08276500	Rio Grande below Taos Junction Bridge, near Taos, N. Mex	9,730	725	597	140	–11	650	420	31
09315000	Green River at Green River, Utah.	40,600	6,298	5,156	215	–18	4,800	3,100	31
11425500	Sacramento River at Verona, Calif	21,257	18,820	28,100	135	+23	17,500	11,310	31
13269000	Snake River at Weiser, Idaho	69,200	18,050	22,090	143	–18	2,312	1,494	30
13317000	Salmon River at White Bird, Idaho	13,550	11,250	4,830	104	–21	5,010	3,238	29
13342500	Clearwater River at Spalding, Idaho	9,570	15,480	4,450	70	–25	12,600	8,140	30
14105700	Columbia River at The Dalles, Oreg[5]	237,000	193,100	79,800	92	–23	140,000	90,000	26
14191000	Willamette River at Salem, Oreg.	7,280	23,510	39,600	91	–33	24,500	15,830	26
15515500	Tanana River at Nenana, Alaska.	25,600	23,460	6,290	93	–46	6,000	3,900	26
08MF005	Fraser River at Hope, British Columbia	83,800	96,290	31,920	73	–34	24,505	15,837	31

[1] Adjusted.
[2] Records furnished by Corps of Engineers.
[3] Records furnished by Buffalo District, Corps of Engineers, through International St. Lawrence River Board of Control. Discharges shown are considered to be the same as discharge at Ogdensburg, N.Y. when adjusted for storage in Lake St. Lawrence.
[4] Records of daily discharge computed jointly by Corps of Engineers and Geological Survey.
[5] Discharge determined from information furnished by Bureau of Reclamation, Corps of Engineers, and Geological Survey.

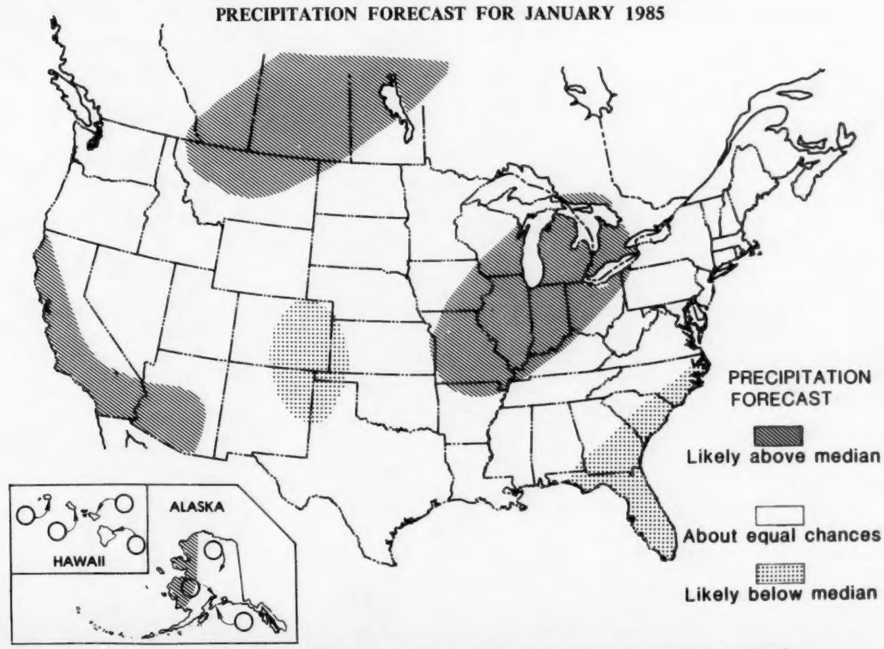
Provisional data; subject to revision

DISSOLVED SOLIDS AND WATER TEMPERATURES, DECEMBER 1984, AT DOWNSTREAM SITES ON SIX LARGE RIVERS

Station number	Station name	December data of following calendar years	Stream discharge during month: Mean (cfs)	Dissolved-solids concentration[a]: Minimum (mg/L)	Dissolved-solids concentration[a]: Maximum (mg/L)	Dissolved-solids discharge[a] (tons per day): Mean	Dissolved-solids discharge[a] (tons per day): Minimum	Dissolved-solids discharge[a] (tons per day): Maximum	Water temperature[b]: Mean, in °C	Water temperature[b]: Minimum, in °C	Water temperature[b]: Maximum, in °C
01463500	Delaware River at Trenton, N.J. (Morrisville, Pa.)	1984	7,200	92	136	2,040	1,450	3,170	5.0	2.5	7.5
		1944–83	13,170	62	138	.....	631	20,500	...	0	12.0
		(Extreme yr)		(1983)	(1980)		(1964)	(1973)			
			[c]11,650								
04264331	St. Lawrence River at Cornwall, Ontario, near Massena, N.Y. (median streamflow at Ogdensburg, N.Y.)	1984	261,000	165	167	117,000	111,000	119,000	5.0	4.0	7.5
		1975–83	262,100	163	170	118,000	88,000	139,000	3.0	0.5	8.0
		(Extreme yr)		(1978)	(1975)		(1978)	(1981)			
			[c]239,200								
07289000	Mississippi River at Vicksburg, Miss.	1984	*755,000	.....	.....	.....	.....	.....	...	...	...
		1975–83	675,900	153	295	376,200	131,000	683,000	7.5	0.5	13.0
		(Extreme yr)		(1978)	(1980)		(1976)	(1982)			
			[c]495,500								
03612500	Ohio River at lock and dam 53, near Grand Chain, Ill. (streamflow station at Metropolis, Ill.)	1984	468,000	148	197	.....	182,000	237,000	...	5.5	9.0
		1954–83	319,400	138	362	.....	21,300	469,000	...	0	14.0
		(Extreme yr)		(1962)	(1969)		(1980)	(1977)			
			[c]286,000								
06934500	Missouri River at Hermann, Mo. (60 miles west of St. Louis, Mo.)	1984	86,200	295	496	98,000	73,000	141,000	3.5	1.5	7.5
		1975–83	68,590	222	770	67,200	34,600	237,000	3.5	0	14.0
		(Extreme yr)		(1982)	(1978)		(1980)	(1982)			
			[c]40,520								
14128910	Columbia River at Warrendale, Oreg. (streamflow station at The Dalles, Oreg.)	1984	158,000	111	128	50,100	34,200	60,600	5.5	3.0	7.5
		1975–83	157,900	82	120	45,300	22,800	77,300	7.0	0.5	10.5
		(Extreme yr)		(1975)	(1983)		(1978)	(1980)			
			[c]87,495								

[a]Dissolved-solids concentrations, when not analyzed directly, are calculated on basis of measurements of specific conductance.
[b]To convert °C to °F: [(1.8 X °C) + 32] = °F.
[c]Median of monthly values for 30-year reference period, water years 1951–80, for comparison with data for current month.
*Dissolved-solids and water-temperature records are not available for December.

PRECIPITATION FORECAST FOR JANUARY 1985



(From Monthly and Seasonal Weather Outlook Published by National Weather Service)

FLOOD CHARACTERISTICS OF URBAN WATERSHEDS IN THE UNITED STATES

The abstract and illustration are from the report, *Flood characteristics of urban watersheds in the United States*, by V. B. Sauer, W. O. Thomas, Jr., V. A. Stricker, and K. V. Wilson, U.S. Geological Survey Water-Supply Paper 2207, 63 pages, 1983. This report may be purchased for $3.00 from Eastern Distribution Branch, Text Products Section, U.S. Geological Survey, 604 S. Pickett St., Alexandria, VA 22304 (check or money order payable to U.S. Geological Survey); or from Superintendent of Documents, Government Printing Office, Washington, D. C. 20402 (payable to Superintendent of Documents).

ABSTRACT

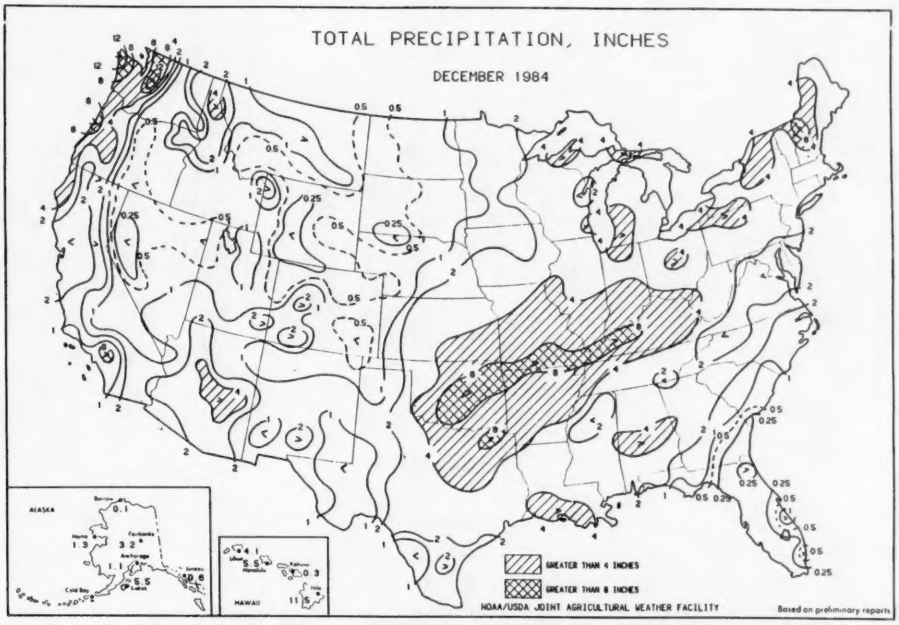
A nationwide study of flood magnitude and frequency in urban areas was made for the purpose of reviewing available literature, compiling an urban flood data base, and developing methods of estimating urban floodflow characteristics in ungaged areas. The literature review contains synopses of 128 recent publications related to urban floodflow. A data base of 269 gaged basins in 56 cities and 31 States, including Hawaii, contains a wide variety of topographic and climatic characteristics, land-use variables, indices of urbanization, and flood-frequency estimates. (See figure 1.)

Three sets of regression equations were developed to estimate flood discharges for ungaged sites for recurrence intervals of 2, 5, 10, 25, 50, 100, and 500 years. Two sets of regression equations are based on seven independent parameters and the third is based on three independent parameters. The only difference in the two sets of seven-parameter equations is the use of basin lag time in one and the lake and reservoir storage in the other. Of primary importance in these equations is an independent estimate of the equivalent rural discharge for the ungaged basin. The equations adjust the equivalent rural discharge to an urban condition. The primary adjustment factor, or index of urbanization, is the basin development factor, a measure of the extent of development of the drainage system in the basin. This measure includes evaluations of storm drains (sewers), channel improvements, and curb-and-gutter streets.

The basin development factor is statistically very significant and offers a simple and effective way of accounting for drainage development and runoff response in urban areas. Percentage of impervious area is also included in the seven-parameter equations as an additional measure of urbanization and apparently accounts for increased runoff volumes. This factor is not highly significant for large floods, which supports the generally held concept that imperviousness is not a dominant factor when soils become more saturated during large storms. Other parameters in the seven-parameter equations include drainage area size, channel slope, rainfall intensity, lake and reservoir storage, and basin lag time. These factors are all statistically significant and provide logical indices of basin conditions. The three-parameter equations include only the three most significant parameters: rural discharge, basin-development factor, and drainage area size.

All three sets of regression equations provide unbiased estimates of urban flood frequency. The seven-parameter regression equations without basin lag time have average standard errors of regression varying from ±37 percent for the 5-year flood to ±44 percent for the 100-year flood and ±49 percent for the 500-year flood. The other two sets of regression equations have similar accuracy. Several tests for bias, sensitivity, and hydrologic consistency are included which support the conclusion that the equations are useful throughout the United States. All estimating equations were developed from data collected on drainage basins where temporary in-channel storage, due to highway embankments, was not significant. Consequently, estimates made with these equations do not account for the reducing effect of this temporary detention storage.

Figure 1.—Location of metropolitan areas included in the nationwide urban flood-frequency study.



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NATIONAL WATER CONDITIONS
December 1984

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EXPLANATION OF DATA

Cover map shows generalized pattern of streamflow for the month based on 18 index stream-gaging stations in Canada and 164 index stations in the United States. Alaska and Hawaii inset maps show streamflow only at the index gaging stations that are located near the points shown by the arrows.

Streamflow for the current month is compared with flow for the same month in the 30-year reference period, 1951–80. Streamflow is considered to be *below the normal range* if it is within the range of the low flows that have occurred 25 percent of the time (below the lower quartile) during the reference period. Flow is considered to be *above the normal range* if it is within the range of the high flows that have occurred 25 percent of the time (above the upper quartile). Shorter reference periods are used for the Puerto Rico index stations because of the limited records available.

Flow higher than the lower quartile but lower than the upper quartile is described as being *within the normal range*. In the National Water Conditions, the median is obtained by ranking the 30 flows for each month of the reference period in their order of magnitude; the highest flow is number 1, the lowest flow is number 30, and the average of the 15th and 16th highest flows is the median. One-half of the time you would expect the flows for the month to be below the median and one-half of the time to be above the median.

Flood frequency analyses define the relation of flood peak magnitude to probability of occurrence or recurrence interval. Probability of occurrence is the chance that a given flood magnitude will be exceeded in any one year. Recurrence interval is the reciprocal of probability of occurrence and is the *average* number of years between occurrences. For example, a flood having a probability of occurrence of 0.01 (1 percent) has a recurrence interval of 100 years. Recurrence intervals imply no regularity of occurrence; a 100-year flood might be exceeded in consecutive years or it might not be exceeded in a 100-year period.

Statements about *ground-water levels* refer to conditions near the end of the month. The water level in each key observation well is compared with average level for the end of the month determined from the entire past record for that well or from a 30-year reference period, 1951–80. *Changes in ground-water levels*, unless described otherwise, are from the end of the previous month to the end of the current month.

Dissolved solids and temperature data for December are given for six stream-sampling sites that are part of the National Stream Quality Accounting Network (NASQAN). Dissolved solids are minerals dissolved in water and usually consist predominantly of silica and ions of calcium, magnesium, sodium, potassium, carbonate, bicarbonate, sulfate, chloride, and nitrate. Dissolved-solids discharge represents the total daily amount of dissolved minerals carried by the stream. Dissolved-solids *concentrations* are generally higher during periods of low streamflow, but the highest dissolved-solids *discharges* occur during periods of high streamflow because the total quantities of water, and therefore total load of dissolved minerals, are so much greater than at time of low flow.

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